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TR EL-82-4

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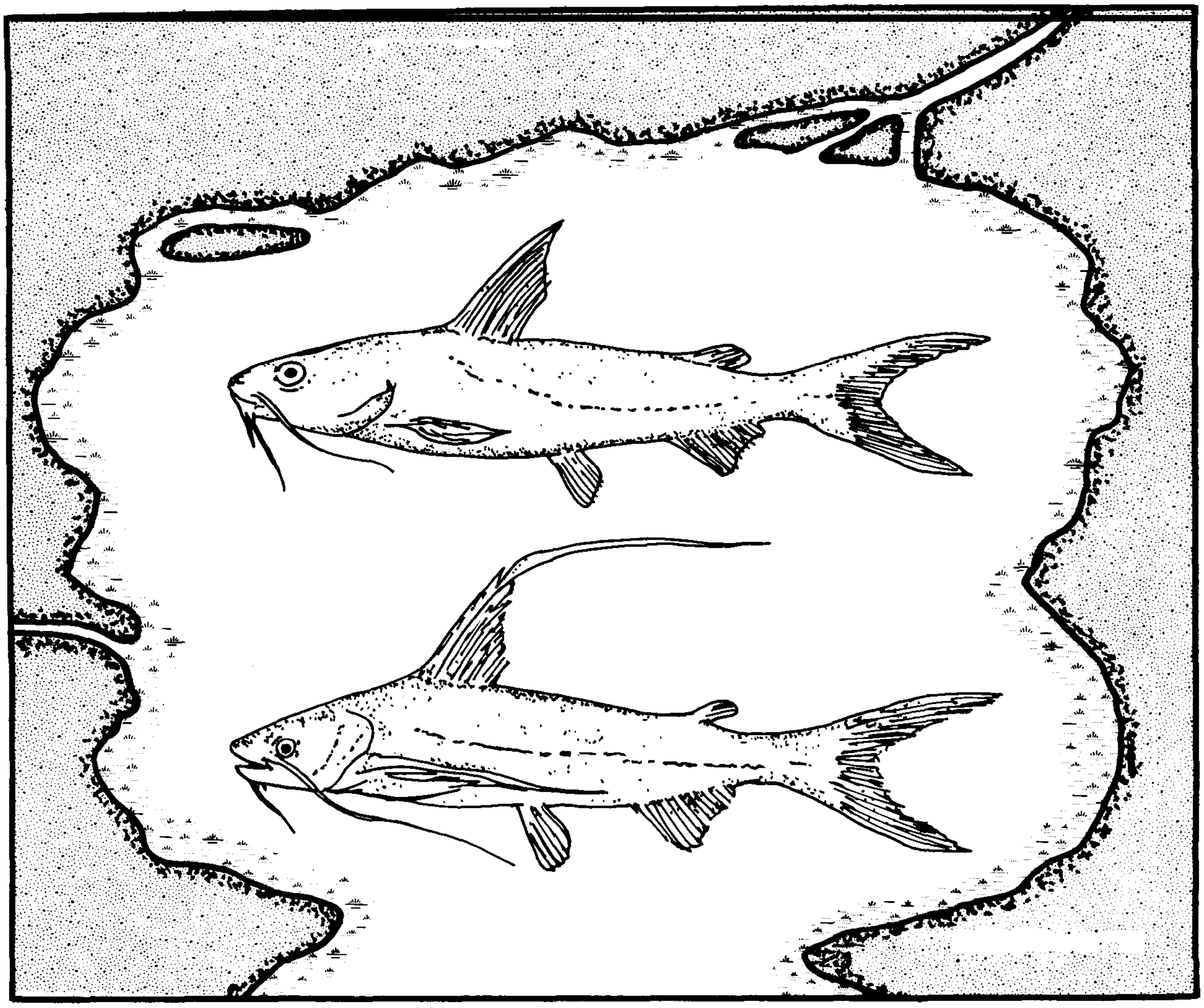

Fish and Wildlife Service
U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station
U.S. Army Corps of Engineers

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SEA CATFISH
AND
GAFFTOPSAIL CATFISH

by

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Waterways Experiment Station

Performed for
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U.S. Department of the Interior
Washington, DC 20240

CONVERSION FACTORS

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
kilometers (km)	0.6214	miles
square meters (m')	10.76	square feet
square kilometers (km')	0.3861	square miles
hectares (ha)	2.471	acres
liters (1)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (gm)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (mt)	2205.0	pounds
metric tons (mt)	1.102	short tons
kilocalories (kcal)	3.968	BTU
Celsius degrees	1.8(C°) + 32	Fahrenheit degrees

U.S. Customary to Metric

Multiply	By	To Obtain
inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
acres	0.4047	hectares
square miles (mi^2)	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft")	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
short tons (ton)	0.9072	metric tons
BTU	0.2520	kilocalories
Fahrenheit degrees	0.5556(F° 32)	Celsius degrees

CONTENTS

PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to:

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Vicksburg, MS 39180

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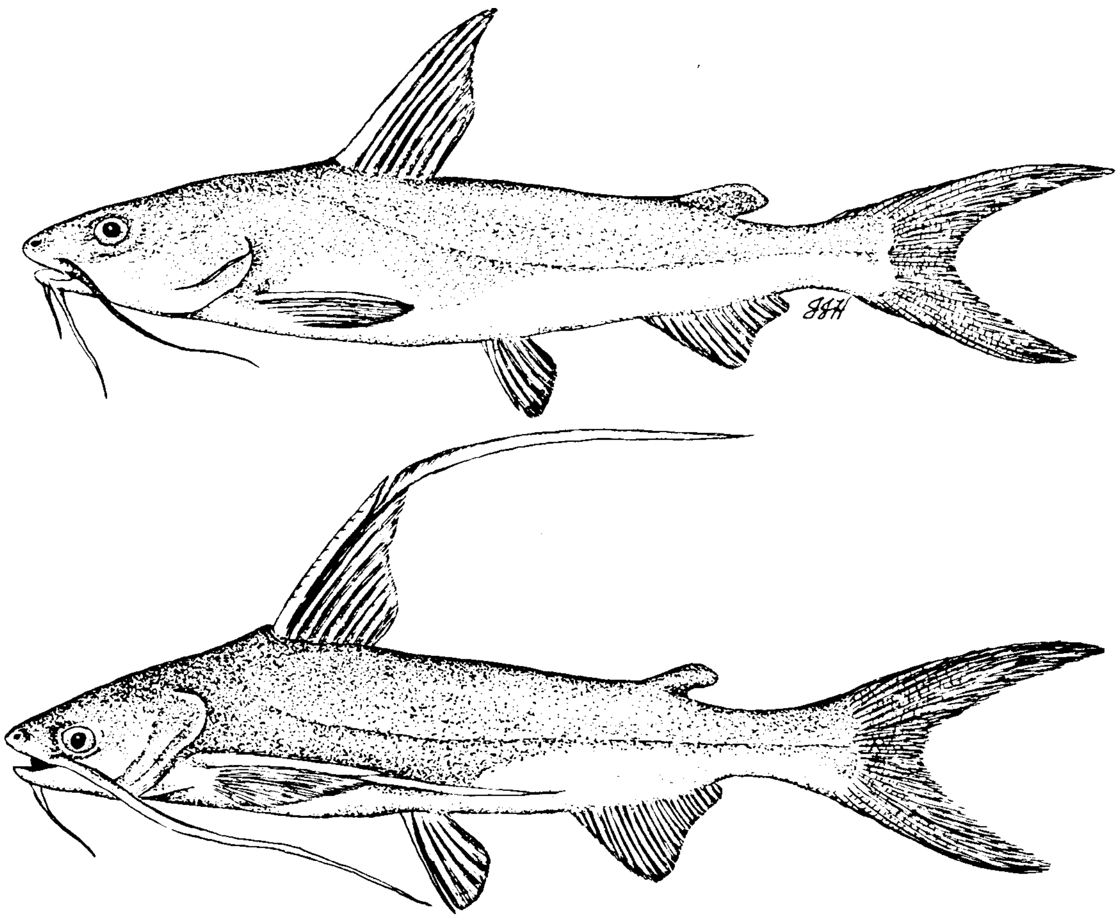

Figure 1. Sea catfish (top) and gafftopsail catfish (bottom).

SEA CATFISH AND GAFFTOPSAIL CATFISH

NOMENCLATURE/TAXONOMY/RANGE

Scientific name .... *Arius felis* (Linnaeus)
Silurus felis .... Linnaeus (type locality Charleston, SC)
Arius milberti .... Cuvier and Valenciennes
Galeichthys .... Cuvier and Valenciennes
Ariopsis felis (L.) ...... Taylor and Menezes
Arius felis (L.) .... Miller
Preferred common name ..... sea catfish (Figure 1, Top)

Other common names .... Smallmouth catfish, silver catfish, hardhead, tourist trout

Scientific name .... *Bagre marinus* (Mitchill)
Silurus marinus .... Mitchill (type locality NY)
Bagre .... Oken
Preferred common name ..... gafftopsail catfish (Figure 1, Bottom)
Other common names .. Bigmouth catfish, gafftop

Class ....Osteichthyes
Order ....Siluriformes
Family ....Ariidae

Geographic range: Sea catfish. Atlantic coastal waters from Cape Cod, Massachusetts, to Yucatan, Mexico. Rarely north of Chesapeake Bay (Merriman 1940). Occasionally enters freshwater (Platania and Ross 1980). Gafftopsail catfish. Coastal waters from Cape Cod, Massachusetts, to Panama, and throughout the Gulf of Mexico (Briggs 1958). Gunter (1942) reported it in freshwater. The principal estuarine and coastal fishery areas for both species in the northern Gulf of Mexico region are noted in Figure 2.

MORPHOLOGY/IDENTIFICATION AIDS

Naked skin, large serrated spines located at the front of the dorsal and pectoral fins, adipose fins, and a forked caudal fin are marine catfish features common with freshwater catfishes (Ictalurus). No barbels on nostrils, steel blue-gray dorsally, and silvery sides (Hoese and Moore 1977) are distinctive marine catfish features.

A. felis: D.I, 7; A. 19-20; P.I, 6-10; V. 6. Two pair of short rounded barbels on lower chin, maxillary barbels nearly as long as the head. Dorsal and pectoral fins without first rays elongated separate sea catfish from gafftopsail catfish with elongated first rays. Body is elongated, steel-blue above and silvery below. Maximum length[1] 495 mm (Perret et al. 1971).

B. marinus: D.I, 7; A. 22-28; P.I. 11-14; V. 6. Two pair flattened barbels on lower chin and maxillary barbels reach nearly to ventral fins. First rays of dorsal and fins have elongated white filament equal to or exceeding spinal length. Anal fin with prominent V-shaped indentation on posterior margin (Merriman 1940). Body robust steel-blue dorsally, and white ventrally. Maximum length 571 mm (Jones et al. 1978).

IMPORTANCE

Sea catfish and gafftopsail catfish are not favored sport or food fishes; however, their widespread distribution and abundance along the nearshore coast from southern Florida to western Texas cause them to rank high in trawl and saltwater angler catches in the Gulf of Mexico. Angler surveys along the northern gulf coast ranked sea and gafftopsail catfish harvest usually 2nd or 3rd and no lower than 13th among all saltwater finfishes. Industrial and commercial catches of these two species are purposefully low because areas with high abundance are avoided unless suitable higher valued fishes co-exist. Catfish are usually culled from trawl catches because of low consumer acceptance in pet food products or as human food fish (Benson 1982). Landings of sea catfish represented less than 2% of the weight in industrial bottom trawl fisheries although exploratory trawl surveys on industrial trawl grounds revealed sea catfish to comprise from 2% to 36% of the weight of bottom fishes (Ragan et al. 1978; Roithmayr 1965). Gafftopsail catfish taken incidentally in menhaden purse seine operations are marketed as food fish in Mississippi (Franks et al. 1972). Commercial fisheries catch statistics probably far underestimate the actual poundages of sea and gafftopsail catfishes harvested, removed, or destroyed during fishing operations.

Commercial and sport fishermen consider the gafftopsail catfish and especially the sea catfish to be

[1]25.4 mm = 1 inch.

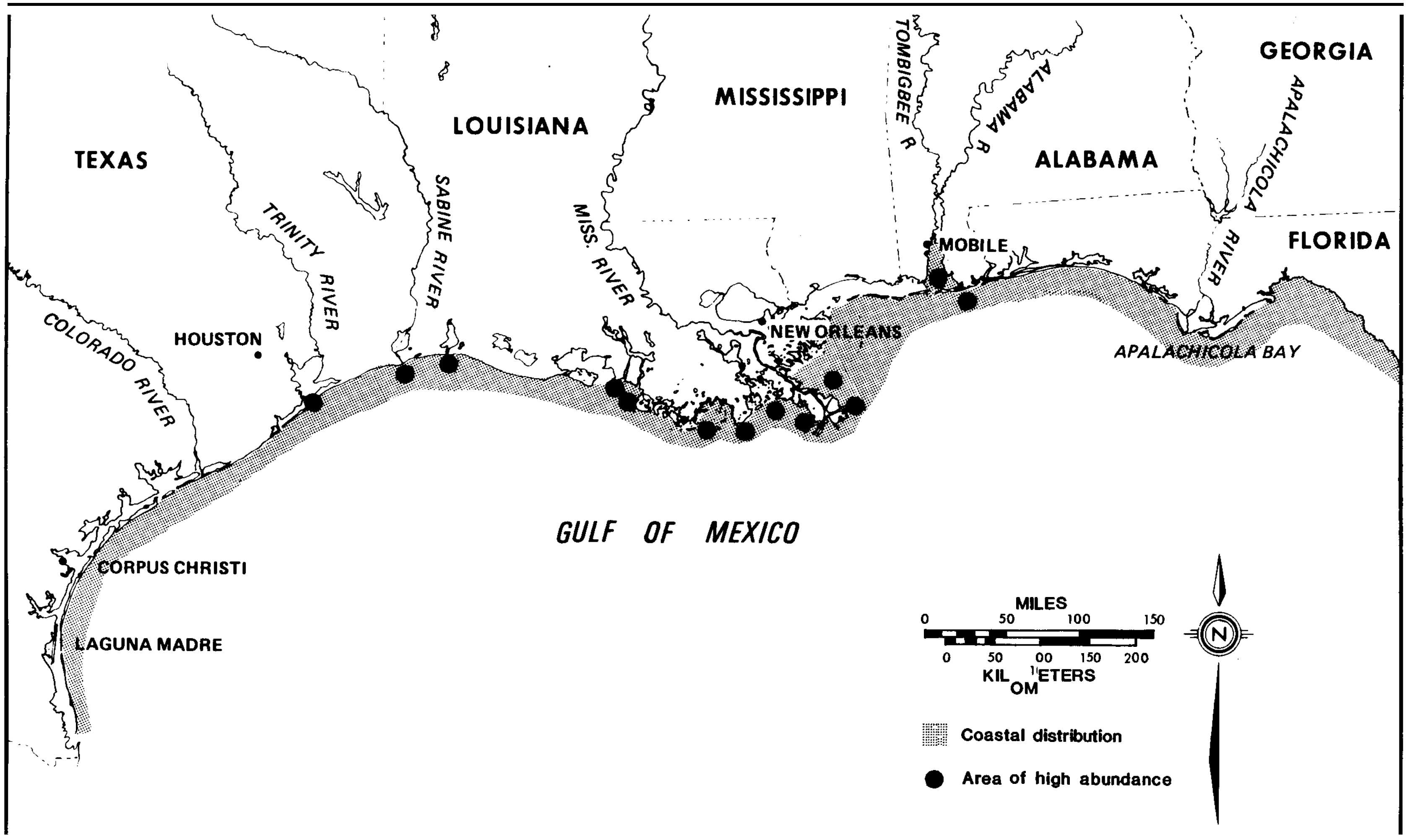

Figure 2 Distribution of sea catfish and gafftopsail catfish along the coast of the Gulf of Mexico.

nuisances and dangerous. Commercial fishermen have difficulties in removing fish entangled by their spines in nets and pump hoses (Benson 1982). The toxic substances from spine punctures by sea catfish ranked high in virulence when compared to larger size freshwater (Ictalurus) catfishes (Halstead et al. 1953; Birkhead 1972). The excessive slimy mucus given off by gafftopsail catfish was a problem in nets and to humans handling this fish (Gudger 1916). Sport fishermen often catch these abundant ariid catfishes and consider them a nuisance when they are fishing for more desirable species in coastal areas.

The oral gestation behavior of male sea and gafftopsail catfish carrying fertilized eggs, larvae, and small juveniles in their mouths has been of scientific interest (Gudger 1916; Lee 1937; Merriman 1940). Also, the eggs of these two species are the largest of all boney fishes (Merriman 1940).

LIFE HISTORY

Spawning

Sea catfish reach sexual maturity before 2 years of age (Benson 1982). The smallest mature gafftopsail catfish examined by Merriman (1940) was a gravid female 265 mm standard length (SL). Lee (1937) found a 126-mm SL gravid female sea catfish, but she stated that 150 mm SL was the minimum size at which sexual differences were noted in pelvic fins of males or females. Merriman (1940) thought that size of first sexual maturity for female sea catfish ranged from 120 to 200 mm SL with most fish maturing at larger sizes. He found several 190- to 200-mm SL immature males; therefore, males probably mature at sizes approaching 250 mm SL.

Ward (1957) reported greater numbers of male sea catfish in a Mississippi Sound spawning area in March and April, but sexes were equally represented in May. Motile sperm were found in males from March until mid-July. Females contained developing ova in March, April, and May. Rapid enlargement of ova by the addition of yolk occurred in early June.

Sea catfish spawn from May to August in back bays sometimes as shallow as 0.6 to 1.2 m (2 to 4 ft) with salinities from 13 to 30 ppt. Gafftopsail catfish spawn over inshore mudflats during a shorter time span (10 days) from May to August (Jones et al. 1978). Females of sea catfish develop flaplike, adipose tissue on pelvic fins (Lee 1937) and pelvic fins of females of both species are larger than pelvic fins of males (Merriman 1940). Gunter (1947) speculated that the highly adhesive nature of extruded eggs from sea catfish and the highly modified pelvic fin flaps suggested fertilization on and transfer from the female's pelvic fins to the male's mouth. The eggs might be picked up from sandy depressions since eggs of these two ariid catfish are demersal and early stages (gastrula) are not reported in collections from males' mouth (Ward 1957). Merriman (1940) did not believe that all mature eggs from a female were extruded at one time.

Female gafftopsail catfish caught on the Alabama coast in April contained well-developed eggs (Swingle 1971). Female sea catfish from the Mississippi Sound examined by Ward (1957) contained 6- to 8-mm eggs in April, 9- to 14-mm eggs in Play, and 14- to 16-mm eggs in June and July. Ova in females during early June enlarged by the addition of yolk and became greenish shortly before ovulation. Male sea catfish contained motile sperm from March until mid-July. Males carried developing young in their mouths from early May until early August (Ward 1957).

Fecundity and Eggs

The large eggs (14 to 19 mm in diameter) of sea catfish and gafftopsail catfish (Merriman 1940) and parental care by males of both species offset the low fecundities of 20 to 64 eggs per female. Gunter (1947) reported smaller, nonfunctional hyaline eggs, attached opposite the micropyle of larger extruded eggs, may serve as a nutritional source for the males during the 60- to 80-day oral gestation period.

Lee (1937), Merriman (1940), Ward (1957), Mansueti and Hardy (1967), and Jones et al. (1978) did not provide fecundity data based on female sea catfish sizes, probably because of numerous small nonfunctional eggs attached to larger eggs. Ward (1957) gave a range of 40 to 62 eggs for 152 female sea catfish and Merriman (1940) reported 20 to 64 mature ova produced each season. Jones et al. (1978) presented no body size relationship data for numbers of eggs ranging from 20 to 68. Gudger (1916) indicated that the ovaries of female gafftopsail catfish are greatly distended by ripe eggs, 10 mm in diameter, that occupy 50% to 60% of the body cavity, and crowd the other organs.

Sea catfish eggs are 12 to 19 mm in diameter, greenish, and demersal; fertilized eggs are oval or elliptical shaped and 14 to 18 mm long. A thin, colorless, adhesive film covering is lost with embryological development. Gafftopsail catfish eggs are 15 to 26 mm in diameter, golden yellow, and demersal. Mansueti and Hardy (1967) and Jones et al. (1978) illustrated and summarized embryological developments for the two species. Eggs of sea catfish hatched in approximately 30 days at 30°C (86°F) (Jones et al. 1978). The incubation period through the yolk-sac.larval stage in the male gafftopsail catfish's mouth was 42 to 70 days, although hatching time and water temperatures were not specified (Jones et al. 1978).

Since the eggs and larvae of both species are retained in the male's mouth until yolk sacs are absorbed, adverse external environmental conditions are reduced by the mobility and supportive actions of the parent. Gudger (1916) mentioned that fine sediments quickly coated demersal gafftopsail catfish eggs in flowing aquaria, thereby reducing oxygen transfer. Lee (1937) suggested that the adhesive film over sea catfish eggs, if left unattended, would be quickly covered by sand and sediment. Ward (1957) found that unaerated sea catfish eggs did not develop. Gudger (1916) reported advanced stages of gafftopsail catfish eggs remained alive for some time in mouths of dead males if moisture was retained on the eggs.

Yolk-Sac Larvae

Jones et al. (1978) reported sea catfish yolk-sac larvae were 29 to 45 mm total length (TL) and gafftopsail catfish yolk-sac larvae approximated 45 to 78 mm TL. This stage remains in the male's mouth for 2 to 4 weeks until the yolk-sac is absorbed. The juvenile stages ranged in length from 68 to 88 mm TL for sea catfish and 80 to 100 mm TL for gafftopsail catfish. Harvey (1972) collected yolk-sac larvae from adult sea catfish in salinities from 8.33 to 12.78 ppt but not at higher salinities.

Larvae

Jones et al. (1978) do not consider a larval stage to exist since all juvenile morphological features are visible prior to yolk absorption.

Juveniles and Adults

All adult characteristics are visible at yolk absorption but juveniles remain in or return to their parents' mouths for protection for a short time. Harvey (1972) found juveniles in mouths of male sea catfish in waters of 16.66 to 28.32 ppt. He stated that older juveniles were able to successfully osmoregulate in higher salinities. Merriman (1940) reported that juveniles of both species fed heavily on planktonic crustacea either inside or outside parents' mouths. Feeding by males carrying eggs or juveniles has not been documented.

Benson (1982) reported that sea catfish juveniles remain in low salinity estuarine areas within the Mississippi Sound. Gunter (1938) reported juvenile gafftopsail catfish abundance in trawl samples peaked during August in Barataria Bay, Louisiana, and during September in offshore gulf waters. Gafftopsail catfish left Barataria Bay from November to January, returning in May and June prior to spawning. Juvenile sea catfish were rarely taken by beach seining although regularly caught by offshore trawling (Reid 1957; Pristas and Trent 1978). Trawl surveys in estuarine waters of Alabama (Swingle 1971), Mississippi (Franks et al. 1972), Louisiana (Perret et al. 1971; Tarver and Savoie 1976; Barrett et al. 1978), and Texas (Reid 1957; Hoese et al. 1968; Gallaway and Strawn 1975) revealed 10 to 100 times fewer juvenile gafftopsail catfish caught than juvenile sea catfish. Juvenile gafftopsail catfish were reported as preferring water temperatures from 16° to 30°C (61" to 86°F) while salinities varied from 0 to 31 ppt. Juneau (1975) reported juvenile gafftopsail catfish in Vermilion Bay, Louisiana, mostly during summer and fall months with water temperatures ranging from 20.4" to 30.5°C (69" to 87°F).

Adults

Sea catfish and gafftopsail catfish distribution and abundance in gulf coastal and estuarine waters have been related to spawning activities as well as to water temperatures and salinities. Studies along southern Florida (Pristas and Trent 1978), northern Florida (Zilberberg 1966), Alabama (Swingle and Bland 1974; Swingle. 1971), Mississippi Sound and Lake Pontchartrain Estuarine Complex (Franks et al. 1972; Rounsefell 1964; Jackson 1972; Tarver and Savoie 1976), Louisiana coast (Perret et al. 1971; Barrett et al. 1978; Adkins et al. 1979), and Texas coast (Gunter 1945; Hellier 1962; Hoese et al. 1968; Moore et al. 1970; Landry and Strawn 1973) indicated sea catfish and gafftopsail catfish were sampled or observed seasonally in greater numbers inshore at higher temperatures (>20°C or 68°F) and salinities (>20 ppt). Adult sea catfish avoided lower water temperatures by migrating offshore in winter and returning inshore in the spring.

Exceptions were reported by Landry and Strawn (1973) at warmwater discharges and by Swingle (1971) for adult sea catfish concentrated in the deep Mobile Ship Channel in Alabama. Adult sea catfish and gafftopsail catfish remained year-round in southern Florida inshore waters (Gunter and Hall 1965; Tabb and Manning 1961; Roessler 1970). Water temperature appears to be the major stimulus, along with salinity, controlling sea catfish and gafftopsail catfish seasonal distributions. Industrial fisheries trawl catches of sea catfishes in Alabama, Mississippi, and Louisiana inshore waters (Haskell 1961) as well as shrimp trawling along the Atlantic Ocean coastal waters of South Carolina, Georgia, and Florida (Anderson 1968) were lower in winter months. Catches were lowest during May in Atlantic Ocean offshore areas off eastern Florida. Roithmayr (1965) reported increased winter catches of sea catfish in the 13- to 48-m (43- to 157-ft) offshore Gulf of Mexico industrial fishery. McClane (1965) stated that in November, sea catfish and gafftopsail catfish migrate from bays and estuaries to the shallow open ocean. They return inshore in February.

Adult sea catfish sometimes school (Gunter 1938; Jones et al. 1978) as do gafftopsail catfish (Gudger 1916). Tavolga (1962) related different sounds of sea catfish and gafftopsail catfish to their nocturnal schooling behaviors, but found distress sounds were similar for both species. Tavolga (1977) further identified and demonstrated acoustical orientation by sea catfish.

GROWTH CHARACTERISTICS

Gallaway and Strawn (1974) reported juvenile sea catfish in Galveston Bay, Texas, grew from 40 to 44 mm SL in July 1968 to 93 mm in October before leaving the bay for the gulf, where little winter growth occurred. The 1967 year class (Age I) reached 111 to 130 mm SL by September 1968. Gunter and Hall (1963) reported Age 0 sea catfish in southwestern Florida grew to 118 to 133 mm TL while Age I juveniles grew to 193 mm TL. Topp (1963) reported a 345-mm TL sea catfish recaptured 445 days after tagging showed a 2-mm decrease in forked length (FL).

Benson (1982) stated that life expectancy of sea catfish was only 2 years with a maximum life span of about 5 years. Ooermann et al. (1977) found from aged pectoral spines of 177 sea catfish collected near Ocean Springs, Mississippi, that 17.1- to 35.5-cm fish lived 3 to 8 growing seasons. Swingle (1971) reported at least three sea catfish age classes in Alabama inshore waters in 1968-1969. Length frequency data for Age 0 sea catfish revealed growth from 47 mm TL in July to 95 mm TL in May of the next year. Length frequency data of gafftopsail catfish showed growth from a mode of 75 mm TL in July to 127 mm TL (range: 95 to 167 mm TL) in September.

COMMERCIAL/SPORT FISHERY

Sea catfish commercial landings include both sea catfish and gafftopsail catfish. Gulf of Mexico commercial landings of "sea catfish" plotted by States for 1959 through 1967 indicated 2-year trends with wide fluctuations (U.S. Department of Commerce 1959-1967). Florida landed 257 metric tons (mt) of catfish in 1960, dropped to 54 mt in 1962, and averaged 105 mt over the 9 years. Sea catfish landing statistics for Louisiana averaged 33 mt over the 9 years. Two-year peak catches did not occur in the same years as in Florida. Sea catfish landings averaged 22 mt for Mississippi and 25 mt for Texas. The average value of the catch was about 6 to 9 cents per pound over the 9-year period. Commercial fisheries catch data probably underestimate the true catches since several references (Gudger 1916; Topp 1963; Roithmayr 1965; Dunham 1972; Ragan et al. 1978) indicate that commercial fishermen consider sea catfish a nuisance and discard them. Industrial bottomfish trawl fisheries along the northern Gulf of Mexico coastal areas from west Florida to Ship Shoals, Louisiana, probably take the largest catches of sea and gafftopsail catfishes, especially around the Mississippi River Delta. Samples of commercial industrial landings in the north-central Gulf of Mexico indicated that sea catfish made up 1% to 3% of the catch from 1959 to 1963 (Roithmayr 1965) and 3% of the catch from 1970 to 1972 (Dunham 1972). Industrial bottomfish landings increased in Florida, Mississippi, Louisiana, and Texas for the period 1959 through 1967. Large quantities of sea catfish and gafftopsail catfish taken in the industrial bottom trawl fisheries of Florida, Mississippi, Louisiana, and Texas (Roithmayr 1965; Dunham 1972; Ragan et al. 1978) may be culled prior to landing or during unloading.

Although the sea catfish and gafftopsail catfish generally are not regarded as favored food or sport fish by the general public, McClane's Standard Fishing Encyclopedia (1965) listed sea catfish as "edible" and gafftopsail catfish as "a good food fish." Many saltwater angler surveys (Tabb and Manning 1961; Jackson 1972; Landry and Strawn 1973; Wade 1977) suggested anglers discard both species, especially sea catfish, as nuisance fish. Therefore, angler surveys generally underestimate abundances, catch rates, and probably harvest of both species. A 1965 saltwater angler survey (Deuel and Clark 1968) reported catfishes ranked second, making up 9% of all saltwater fishes caught from the Florida west coast to the Mississippi River. From the Mississippi River to Texas, catfish ranked sixth, making up 3% of saltwater fish caught. Onsite harvest surveys of anglers found sea and gafftopsail catfish ranked third and constituted 20% of the catch in southern Florida (Tabb and Manning 1961), ranked 13th and constituted 2% of the catch in Alabama (Wade 1977), ranked third and constituted 3% of the catch in Mississippi Sound (Jackson 1972), and ranked second and constituted 31% of the catch in a Galveston Bay, Texas, hot-water discharge (Landry and Strawn 1973). Juneau and Pollard (1981) reported sea catfish ranked third (10%) and gafftopsail catfish ranked ninth (1%) in a P-year recreation angling survey in Vermilion Bay, Louisiana. Sea catfish are usually more abundant than gafftopsail catfish along the northern Gulf of Mexico coast and both species are most abundant off Louisiana.

Analyses from a 1960 oxygen depletion die-off in southern Florida (Tabb and Manning 1961) revealed a 10 to 1 ratio of sea to gafftopsail catfish. Trawl sampling revealed an 80 to 1 sea catfish to gafftopsail catfish ratio in Alabama coastal waterways (Swingle and Bland 1974); a 100 to 1 ratio in Mississippi Sound (Franks et al. 1972); a 5 to 1, or greater, ratio in the Lake Borgne area (Rounsefell 1964; Tarver and Savoie 1976); but ratios approached 2 to 1 in southwestern Louisiana inshore waters (Perret et al,, 1971; Juneau 1975; Barrett et al. 1978; Perret and Caillouet 1974). Abundances of sea catfish and gafftopsail catfish reportedly decreased in trawl samples from 5% in Louisiana to 2% along the Texas coast (Moore et al. 1970), but Bechtel and Copeland (1970) found sea catfish to be the most abundant fish during the fall in most areas of Galveston Bay, Texas. Landry and Strawn (1973) found sea catfish made up 31% of the sport catch in Galveston Bay, and outnumbered gafftopsail catfish 82 to 1. Diener (1973) found sea catfish to be the fifth most abundant fish in trawling samples in the tidal Colorado River,Texas, from February to June 1962 and 100 times more numerous than gafftopsail catfish. Breuer (1962) reported sea catfish common around Port Isabel, Texas, whereas gafftopsail catfish were not common.

Incidental catches of fishes in 89 menhaden purse seine sets along the Mississippi-Louisiana coast in 1958-59 (Christmas et al. 1960) revealed equal numbers of sea catfish and gafftopsail catfish and each ranked fifth in abundance. Observers noted gafftopsail catfish in twice as many sets, but possible prior removal by fishermen of gafftopsail catfish for food during landings probably reduced their numbers in deck counts.

Exploratory trawl sampling and saltwater angler surveys suggest that sea catfish and gafftopsail catfish were abundant in estuarine and nearshore regions from Alabama to east

Texas (Hellier 1962; Moore et al. 1970; Ragan et al. 1978; Barrett et al. 1978). Moore et al. (1970) indicated that sea catfish averaged 5% of the total weight of 1962-64 exploratory trawl catches along the Louisiana coast and 2% of the catch along the Texas coast. In the spring, sea catfish increased to 10% of inshore (7 to 14 m or 23 to 46 ft depth) catches but decreased to a small percentage of winter catches. They did not find that either catfish contributed over 5% by weight in any season at depths greater than 14 m (46 ft). Perret et al. (1971) reported sea catfish made up 2.5% of the fishes in trawl catches along the Louisiana coast, and outnumbered gafftopsail catfish 2 to 1. Both species were most abundant around Grand Isle, Louisiana. Ragan et al. (1978) reported greater percentages of sea catfish in catches on Louisiana western shelf waters (88° to 93" longitude) at depths to 18 m (59 ft). Sea catfish abundance on the eastern shelf inner zone reached 37% (first ranked) in the summer, but dropped to 8% in the winter, averaging 24% over all seasons. Abundance never reached 5% in depths 24 to 100 m (79 to 328 ft). Sea catfish seasonal and depth distribution patterns were similar on the western Louisiana shelf area. Ragan et al. (1978) calculated the abundance of sea catfish in all zones and areas as 10% of catches. The high numbers of sea catfish in the western shelf and smaller populations of Atlantic croakers limit industrial bottom fishing west of Ship Shoals, Louisiana. Benson (1982) stated that catfish spine regurgitation by pets adversely affects consumer reaction to catfish uses in the pet food industry. Commercial fishermen found catfish to cause problems because of entanglement in nets and pump hoses (Benson 1982).

ECOLOGICAL ROLE

Sea catfish and gafftopsail catfish, as opportunistic feeders over mud and submerged sand flats (Gudger 1916), maintain relatively high abundance in most northern Gulf of Mexico estuarine and inshore areas. Diets of gafftopsail and sea catfish are similar (Merriman 1940). Algae, sea grasses, coelentrates, holothurians, gastropods, polychaetes, crustaceans (shrimp, crabs), and fishes were common items in stomachs of both species. Large fish scales and human garbage in some stomachs indicated scavenging in both species (Merriman 1940). Several authors (Gudger 1916; Gunter 1945; Darnell 1961; McClane 1965; Gallaway and Strawn 1974) indicated blue crabs were a principal food item of sea and gafftopsail catfishes. Gallaway and Strawn (1974) reported that sea catfish concentrated at a hot-water discharge to feed on discharged impinged prey organisms and small blue crabs when the water temperature remained below 38°C.

After finding that 50% of the sea catfish caught in a stationary wing-net in a 4-hour evening period contained juvenile and sub-adult brown shrimp, Harris and Rose (1968) expressed concern over the possible impact by this fish on commercially important shrimp populations. However, they recognized that net capture of shrimp and sea catfish could alter predation estimates from those in open waters. Ward (1957) reported sea catfish concentrating near a shrimp cannery at Biloxi Bay, Mississippi.

Juvenile sea catfish have been reported to feed on microcrustaceans while still being carried in males' mouths (Merriman 1940). Darnell (1961) reported that larger juvenile sea catfish stomachs contained 56% organic detritus, 26% microinvertebrates, and 16% larger invertebrates. He found adult sea catfish eat 44% organic detritus, 34% large invertebrates, and 21% microinvertebrates. Reid et al. (1956) reported organic debris, crabs, menhaden, and worm eels in stomachs of four gafftopsail catfish 235 to 298 mm (9.2 to 11.7 inches) long from East Bay, Galveston, Texas. Merriman (1940) speculated that fishes found in sea and gafftopsail catfish stomachs may have been picked up from fishermen discards. Hoese (1966) observed lepidophogy, or scale feeding, as well as sea catfish attacking fins of other fishes.

Fuel oil at concentrations of 0.02 ml/l water did not affect feeding behavior of sea catfish, but 0.08 ml/l water caused sea catfish to regurgitate consumed foods and lose mucus layers in stomachs (Wang and Nicol 1977). Sea catfish heart rates slowed at 0.01 ml fuel oil/l water and the lethal concentration for 50% of the fish tested for 96 hours was 0.14 ml fuel oil/l water.

Sea catfish have been reported as prey for longnose gar (Darnell 1961). Dugas (1975) captured twice as many sea catfish at night than during the day by trawl and stated that they are largely scavengers. Fishermen use live sea catfish as bait for large cobia at oil rigs off the Louisiana coast.

ENVIRONMENTAL REQUIREMENTS

Temperature

Adult sea catfish prefer water temperatures' above 25°C (77°F) (Jones et al. 1978), but avoid waters over 37°C (99°F) (Landry and Strawn 1973; Gallaway and Strawn 1974). Sea catfish were collected from 38" to 39°C (100° to 102°F) effluent but some fish were observed in apparent thermal shock (Gallaway and Strawn 1974). Sea catfish leave inshore areas for deeper channels (Swingle 1971) or offshore areas when water temperatures drop below 5" to 6°C (41 to 43°F) (Perret et al. 1971; Juneau 1975). Barrett et al. (1978) found that the sea catfish trawl catch along the Louisiana coast was related to water temperatures between 10" and 20°C (50" to 68°F).

Juvenile and adult gafftopsail catfish prefer water temperatures 25°C (77°F) and higher (Perret et al. 1971; Juneau 1975). Barrett et al. (1978) found gafftopsail catfish to be absent from 16-ft exploratory trawling samples. at temperatures below 16.6°C (62°F) and Perret et al. (1971) caught only one specimen at a temperature below 20°C (68°F). Comparatively, a catch of 2,227 gafftopsail catfish was taken from 20" to 34.9°C (68" to 95°F) water.

Salinity

Adult sea catfish have been captured from waters with salinities ranging from 0 to 40 ppt (Jones et al. 1978). Harvey (1972) reported yolk-sac larvae found in the mouth of males in water salinities 8.3 to 12.8 ppt; juveniles were collected in 16.7 to 28.3 ppt salinities. Gunter and Hall (1965) found juveniles in water with 0.1 ppt salinity. Juveniles are reported to be more numerous than adults in low salinity waters (Swingle and Bland 1974; Kelley 1965; Tarver and Savoie 1976; Jones et al. 1978). Perret et al. (1971) captured the most sea catfish at salinities 10 ppt or higher. Gunter (1945) collected sea catfish at salinity ranges of 2 to 36.7 ppt, but the greatest abundance occurred above 30 ppt.

Adult gafftopsail catfish have been recorded from freshwater, but are more abundant in salinities of 5 to 30 ppt (Perret et al. 1971; Jones et al. 1978). Juvenile gafftopsail catfish have been collected in salinities of 0.2 ppt (Gunter and Hall 1965), 2.5 ppt (Kelley 1965), 3.3 ppt (Tarver and Savoie 1976), up to 25 ppt (Swingle and Bland 1974), and 33 ppt (gulf salinity) when juveniles leave Alabama bays

(Swingle 1971) and Texas bays (Gunter 1945).

Dissolved Oxygen

Benson (1982) cited Adkins and Bowman (1976) as collecting sea catfish from closed canals with low oxygen concentrations. Tabb and Manning (1961) reported sea and gafftopsail catfish killed by total oxygen depletion in two Florida bays following Hurricane Donna in 1960. Parental care of sea and gafftopsail catfish eggs would reduce the potential impacts of reduced oxygen levels and sediments.

Substrate

Reid (1957), Ragan et al. (1978), and Shipp (1981) reported sea catfish abundance higher in areas with high organic substrates. Darnell (1961) and Reid et al. (1956) reported sea catfish and gafftopsail catfish stomachs to contain quantities of organic detritus along with invertebrates associated with organic substrate. Artificial food sources from seafood processing plants and associated docking facilities as well as warmwater discharges containing impinged organisms can create localized sea and gafftopsail catfish concentrations independent of substrate.

Depth

Depth preferences of sea catfish and gafftopsail catfish appear to be related to water temperatures and bottom composition. Both species begin moving offshore or into warmer waters associated with deep channels (Swingle 1971) as water temperatures drop below 10” to 15°C (50” to 59°F) in late fall only to return in spring when temperatures rise above these levels. Higher abundances in shallow (<20 m) inshore coastal areas and estuaries appear related to organic substrate and associated invertebrate food sources. The low frequency of catfish in small seine samples suggests they do not commonly occur in shoreline beach habitats (Reid 1957; Perret et al. 1971; Juneau 1975; Tarver and Savoie 1976).

Water Movement

Reid (1957) indicated sea catfish concentrated near Rollover Pass, Texas, where restricted tidal flow created a "jet-effect" to faunistically rich waters. Landry and Strawn (1973) reported both ariid catfishes were able to remain and feed in waters above 34°C (93°F) at power generating plant discharge rates of 48 m^3/s (1695 ft^3/s) when most other estuarine fish had moved farther away into Galveston Bay, Texas. Water movements appear to be used by ariid catfishes to locate and obtain prey. Spawning and oral gestation occurred in shallower bay areas where water movements are reduced. Juveniles, independent of parents, tend to be found in quiet water bays (Swingle and Bland 1974).

Turbidity

Platania and Ross (1980) reported sea catfish to be found in turbid, shallow, coastal waters with sand or mud substrate. References cited in Life History and Fishery Sections illustrated preference for inshore muddy or sandy bottoms of high organic content. Gudger (1916) collected gafftopsail catfish from turbid waters at Beaufort, North Carolina, and he suggested that tactile barbels enabled these fish to quickly locate food items. Tavolga (1962, 1971, 1977) demonstrated that sounds produced by sea catfish and gafftopsail catfish could enable catfish to avoid obstructions, and probably predators, at close range. Sounds may also enable catfish to communicate with each other during breeding and nocturnal schooling. Sea catfish produce "percolator" choruses from 1700 to 2250 during April through October. A summer lull occurs in July and August when light intensity falls below 1900 fc (Breder 1968). Sound orientation and communication, along with highly developed olfactory senses, would be especially useful in turbid waters.

Hoese et al. (1968) reported that generally high nocturnal trawl catches of sea and gafftopsail catfishes dropped off in August 1964 because of high turbidity and possible changes in fjsh sizes. Landry and Strawn's (1973) Texas creel census data show sea catfish catch rates increased in March 1969 even though catch rates for the five other major species decreased because of rough, murky waters. Gunter (1947) collected breeding sea catfish from rapidly rising, turbid waters in a 0.6- to 3-m (2- to 10-ft) deep pass in Copano Bay, Texas.

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16. Abstract (Limit: 200 words)
Species profiles are literature summaries of the taxonomy, morphology, range, life history, and environmental requirements of coastal aquatic species. They are designed to assist in environmental impact assessment. Sea catfish and gafftopsail catfish are not preferred sport nor commercial fish; however, their high abundance inshore along the northern Gulf of Mexico causes them to rank 2nd or 3rd and no lower than 13th of all saltwater finfish in angler surveys. Sea catfish comprised less than 2% in industrial bottom trawl fisheries although surveys in depths to 20 m revealed they comprised 2% to 36%, by weight, of the bottom fishes. Sea catfish attain sexual maturity before 2 years of age, and spawn from May to August in shallow bays. Adult males do not feed for 60 to 80 days while carrying fertilized eggs and sac-fry in their mouths. Juveniles remain in low-salinity estuaries until decreasing water temperatures cause movements into deeper channels and offshore waters. Adult fish prefer water temperatures above 250C but remain inshore at temperatures above 10°C. Sea catfish and gafftopsail catfish have been collected from waters with salinities ranging from 0 to 30 ppt, but prefer water salinities above 10 ppt. Water depth preferences of sea catfish and gafftopsail catfish appear related to water temperature, salinity, and bottom substrate. As juveniles, both species are opportunistic feeders utilizing microcrustaceans, and as adults, they feed upon detritus, microcrustaceans, and larger invertebrates. Blue crabs and shrimp are considered major food items.

17. Document Analysis a. Descriptors
Estuaries
Fishes
Growth
Feeding

b. Identifiers/Open-Ended Terms
Sea catfish
Arius felis
Gafftopsail catfish
Bagre marinus
Salinity requirements
Temperature requirements
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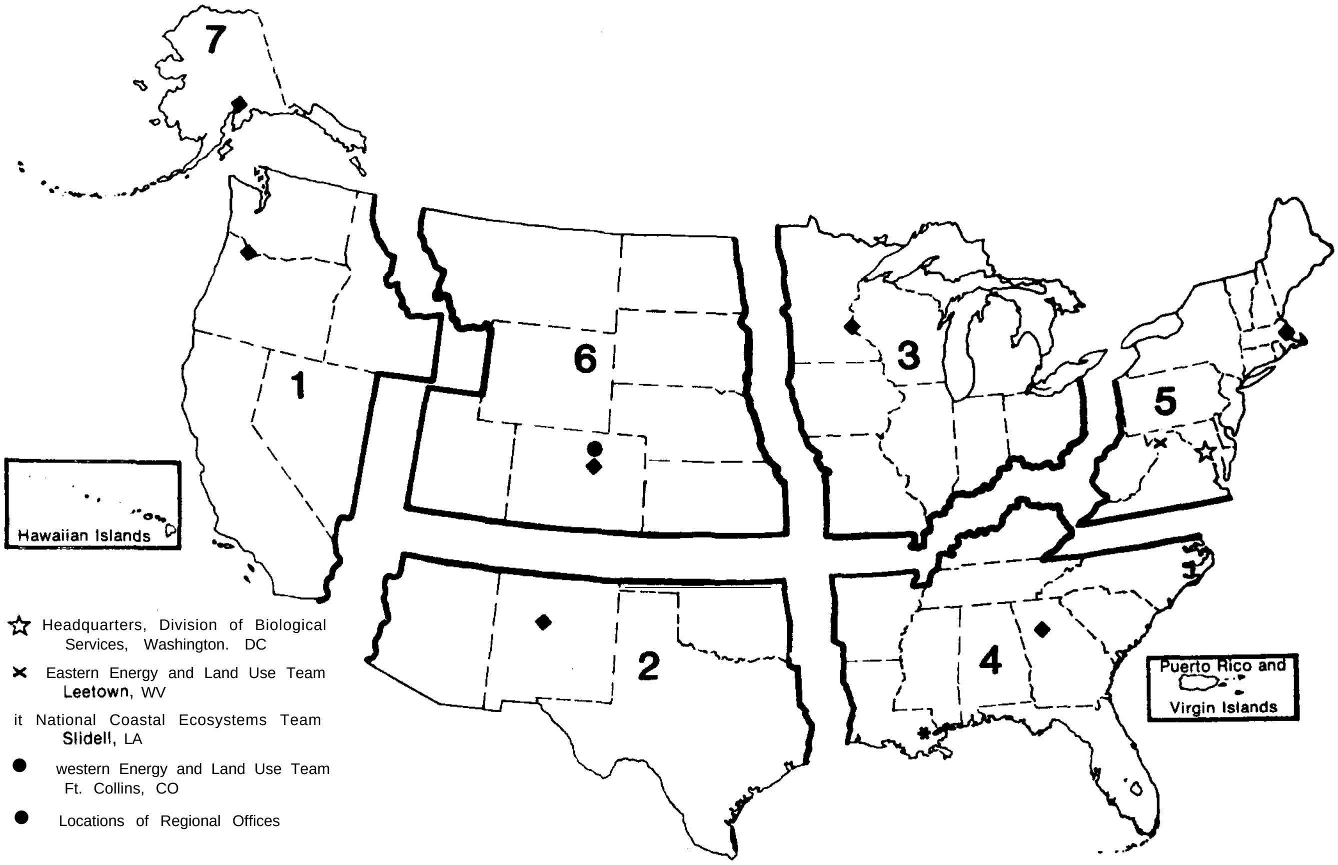

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